8th Annual Salt Lake County

Watershed Symposium

November 19-21, 2014

Utah Cultural Celebration Center
West Valley City, Utah

SALT LAKE COUNTY

Watershed Planning & Restoration Program
Salt Lake County Government Center
2001 South State Street, Suite N3100, Salt Lake City UT 84190
(385) 468-6600 | watershed.slco.org

Welcome!

As the host of the 8th Annual Salt Lake County Watershed Symposium, Salt Lake County welcomes its community of water stewards and environmental advocates. This free 3-day event is made possible through collaboration with numerous individuals and agencies. In particular, we would like to thank the speakers and field trip leaders for their willingness to share their experience and expertise with us—this event would not be possible without them. Additionally, we would like to thank Salt Lake County Mayor Ben McAdams and the Salt Lake County Council for their support in helping to make the Symposium a reality.

The goal of the Watershed Symposium is to encourage a comprehensive review of the current state of our watershed, and facilitate discussions between environmental advocates, policy makers, teachers, students, water quality experts, members of the interested public, and those working in related professions. Feature presentations and field trips—from general interest to technical—explore a broad scope of watershed issues.

In order to assist in future efforts, please complete the Session Feedback forms found in each breakout room, as well as the online Watershed Symposium Survey at watershed.slco.org/symposium. Your feedback and suggestions are greatly appreciated.

Thank you and enjoy!

Salt Lake County
Watershed Planning & Restoration Program

Marian Hubbard, Bob Thompson, and Lynn Berni

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10:10 - 11:00	**Mountain Accord: Harmony or Noise?** Pat Shea PAS, PC *Intermediate*	**303(d) for You and Me: A Long Term Vision for Water Quality** Carl Adams, Erica Gaddis, Jim Harris Utah Division of Water Quality *Introductory*	**Innovative Tools for Water Education** Laura Hanson, Jordan River Commission; Nick Schou, Utah Rivers Council; Leslie Kelen, Center for Documentary Expression and Art *Introductory*
11:15 - 12:05	**In Accord With Our Watersheds** Panelists: Laura Briefer, Salt Lake City; Marian Hubbard-Rice, Salt Lake County; Ann Ober, Clint McAffee, Park City Moderator: Stacey Arens, MWH *Introductory*	**Environmental Crimes: Clean Water Act Enforcement and Teamwork** Ron Lund Salt Lake County Health Dept. Sgt. Alex Huggard Salt Lake County DA *All*	**Win, Win, Win! Jordan River Bird Monitoring Through Citizen Science** Peter Woodruff, Rachel LeBlanc Tracy Aviary *Intermediate*
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THURSDAY, November 20 — Utah Cultural Celebration Center

8:30-9:30	**Check-in/Registration**		
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10:10 - 11:00	**iUTAH: Enabling Sustainable Water Systems for Utah** Panelists: **Zach Aanderud,** Brigham Young University **Courtney Flint, Jeff Horsburgh, Doug Jackson-Smith,** Utah State University Moderator: **Michelle Baker,** Utah State University *Introductory*	**Our Watershed in 2050? The Impact of Adding 2.5 Million People to the Wasatch Front and Back?** **Robert Grow** Envision Utah *Introductory*	**Late Breaking Headlines from the Stormwater News & Gazette** **David Hirschman** Center for Watershed Protection *Introductory*
11:15 - 12:05		**Utah at a Crossroads: Climate Change Impact to Our Watersheds** **Zach Frankel** Utah Rivers Council *All*	**And the Experts Say... Expert Panels of the Chesapeake Bay TMDL** **David Hirschman, Bill Stack** Center for Watershed Protection *Intermediate*
12:05 -1:20	**Lunch**		
1:35-2:25	**Water Flows Through the City: Planning Perspectives** **Sarah Hinners, Martin Buchert, Erfan Goharian, Phillip Stoker** University of Utah *Intermediate*	**Conserving Water Without Reducing Quality of Life** **Kelly Kopp, Joanna Endter-Wada, Roger Kjelgren, Paul Johnson, Larry Rupp** Utah State University *Intermediate*	**Stormwater Programs in Utah: What Managers and Operators Think** **Andrea Armstrong,** Utah State University; **Steve Burgon,** Salt Lake County *Intermediate*
2:40-3:30	**Research, Monitoring & Recovery on Utah Lake** Panelists: **Hilary Arens,** Div. Water Quality; **Weihong Wang, Eddy Cadet,** Utah Valley Univ; **Michael Mills,** June Sucker Recovery Program Moderator: **Suzanne Walther,** Utah Valley Univ. *Intermediate*	**Going Native in the Landscape** **Larry Rupp, Richard Anderson, Jerry Goodspeed, JayDee Gunnell** Utah State University *Intermediate*	**Beyond the Pulaski: Conservation Corps in the 21st Century** **Dave Bastian** Utah Conservation Corps *Introductory*

FRIDAY, November 21

10:00 - 12:00	**FIELD TRIP 1** **Jordan Basin Water Reclamation Facility Tour** Guides: JBWRF staff Meet in lobby of the JBWRF Administration Building 13826 Jordan Basin Lane Riverton, UT *All*
1:00-3:00	**FIELD TRIP 2** **Jordan Basin Water Reclamation Facility Tour** See details above *All*
1:30 - 4:00	**FIELD TRIP 3** **iUTAH Activities in the Red Butte Watershed** Guides: Jim Ehleringer, Brenda Bowen, Alison Chan, David Eiriksson, Steven Hall, Christine Pomeroy, University of Utah Meet in the lower parking lot of Red Butte Gardens Visitor Center 300 Wakara Way, Salt Lake City *All*

Field Trip info:
- Must be pre-registered to attend
- Dress for the outdoors, walking shoes recommended
- Bring your own food and drink

Session Level:
- *Introductory*
- *Intermediate*
- *All*

SALT LAKE COUNTY

For more information, visit watershed.slco.org/symposium

Updated 11/18/14 (subject to change)

Opening Comments

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Keynotes

Mountain Accord: Not Another Study on the Shelf

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Few places in the world have a natural asset as valuable as the Central Wasatch Mountains are to the communities surrounding them. The mountains provide us with water, easy access to superb recreational opportunities, landscape-scale habitat protection, and they serve as the place-maker for our region. However, these mountains face challenges from increasing population, increased use, development pressure, traffic congestion. Described as an "Olympic-sized" collaborative effort, the Mountain Accord is a multi-phase initiative that seeks to make critical decisions regarding the future of the central Wasatch Mountains. It will holistically evaluate and address issues and goals centered on four topic areas: environment, recreation, transportation, and economy. It is a unprecedented collaboration between public and private interests, including state and local governments, federal agencies, and business and grassroots organizations. The Project Area for Mountain Accord includes portions of Salt Lake, Summit, and Wasatch counties. The area is bounded on the west by the existing transportation backbone in the Salt Lake Valley (Salt Lake International Airport, TRAX/FrontRunner, and I-15), on the east by highway 40, on the north by Parley's Canyon, and on the south by Little Cottonwood Canyon. This project is already underway and if you have not yet heard of Mountain Accord, you will! This proposed keynote address will introduce participants to this large initiative and ask them to get involved. Make no mistake - this will not be another study on the shelf. The Mountain Accord process will make hard decisions regarding the future of this precious resource while balancing the economic, environmental, recreational, and transportation needs and challenges today and into the future. The first phase is underway and will culminate in January 2015 in a broad agreement on a preferred scenario that will identify optimal areas for preservation and development and environmentally sustainable transportation corridors and modes. The second phase will include NEPA, if applicable.

iUTAH: Science for Utah's Water Future

Michelle Baker, Project Director iUTAH EPSCoR
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iUTAH (innovative urban transitions and arid-region hydrosustainablity) is a research and training project aimed at strengthening statewide capacity to understand Utah's water systems now and into the future. Our research and training platform focuses on the urbanizing Wasatch Front. This keynote will serve as an introduction to some, and an update to others on the vision, goals, and accomplishments to date. The keynote will be followed by a panel with several of our team leaders wherein we aim to have a discussion with symposium participants on future research and training directions that would benefit Utah's water community.

Breakout Sessions (listed alphabetically by title)

303(d) For You and Me—A Long-Term Vision for Water Quality

Carl Adams, Program Manager Watershed Protection
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Erica Gaddis, Program Manager Water Quality Management
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Jim Harris, Program Manager Monitoring
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The Clean Water Act (CWA) has resulted in dramatic improvements to the health of the nation's streams and lakes over the last 40 years. Key to the Act's success has been its evolution over that time to address municipal and industrial point sources, storm water, and non-point sources. More recently, restoration efforts of impaired waterbodies have been directed by Total Maximum Daily Loads. Over the same time, major technological advancements have helped us collect, analyze, and interpret large data sets needed to make sound decisions regarding water quality. Geographic Information Systems, remote sensing, satellite imagery, continuous data sondes, telemetry systems, and many other tools, have greatly enhanced the ability of water quality managers to better understand our environment. We are no longer constrained to act by a lack of information, but rather by the abundance of it, i.e. "analysis paralysis". What is needed most now for decision making are the collective values of those who rely on the quality of our waters for their health, economic prosperity, and quality of life. We must prioritize our limited resources to achieve the greatest "bang" in quality for every "buck" invested. Further, integration of water quality management with other aspects of natural resource management is necessary to direct implementation that maximizes benefits to society. In the coming decades, this will require evaluation of tradeoffs driven by our values. To that end a new national vision has been proffered by EPA to guide the path forward to protect and restore our most vital resource, clean water.

Vision Elements:
Engagement—Actively engage the public and other stakeholders to improve and protect water quality.
Prioritization—Review, prioritize, and report priority waters for restoration and protection.
Integration—Coordinate integration across CWA and other statutory programs to achieve water quality goals.
Protection—Identify protection priorities and approaches to help prevent impairments in healthy waters.
Alternatives—Incorporate adaptive management and, in addition to TMDLs, tailor approaches to achieve water quality goals, including reducing nonpoint sources of pollution.
Assessment—Use site-specific assessments to identify healthy and impaired waters in priority watersheds.

Level: Intermediate

"And the Experts Say. . ." Expert Panels of the Chesapeake Bay TMDL

David Hirschman, Program Director
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Bill Stack, Deputy Director
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The Chesapeake Bay region has embarked on a massive watershed experiment with the adoption and implementation of the Chesapeake Bay TMDL. There are some indications that what is learned in the

Chesapeake will be applied to other regional TMDLs across the country. Some notable features of the Chesapeake Bay TMDL are that: (1) numerical pollutant load reductions goals established by the computer model are translated into state-specific reduction targets and even phased reduction requirements in MS4 permits, (2) many types of BMPs can be used to meet the reduction targets, but BMP-specific crediting must first be approved through an Expert Panel process, and (3) the TMDL targets are enforceable through permits and Watershed Implementation Plans. This session will report on the Chesapeake Bay process, with particular emphasis on the Expert Panels that consider crediting for various BMPs. This information is valuable for places like Utah, where the future may hinge on lessons learned in the Chesapeake.

Level: Intermediate

Behind the Bushes—Unseen Residents of the Jordan River Parkway Trail

Kerry Cramer, Environmental Health Scientist
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Lowell Bodily, Environmental Health Scientist
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This presentation will cover transient camps along the Jordan River Parkway Trail and the problems they create. Due to solid waste, human feces, drugs, pornography, theft, and safety issues to the users of the Parkway Trail, the Salt Lake County Health Department has devoted resources to removing camps and minimizing their impact. Various governmental and private social service groups had made tremendous efforts to provide services the homeless. The population being discussed, for the most part, will not take advantages of such programs due to drug and alcohol use, mental illness, etc. The presentation will cover current activities and future partnerships needed in this activity.

Level: Introductory

Beyond the Pulaski: Conservation Corps in the 21st Century

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Modern 21st Century Conservation Corps have evolved from the trail crews of the past and can now assist project partners on a wide variety of restoration projects. We still use the hand tools and engage in projects that would be familiar to a "CCC boy" from the 30's, but we now also count GIS enabled tablets and federally recognized certifications in our pack of tools and are helping to implement environmental solutions to problems that didn't exist 80 years ago. From internships to field crews, iPads to chainsaws, urban rivers to wilderness watersheds, Conservation Corps like the Utah Conservation Corps have the tools and know-how to assist your project needs. Come learn more about the ways modern Conservation Corps are using our unique partnerships and cutting edge tools to get the job done.

Level: Introductory

Conserving Water Without Reducing Quality of Life

Kelly Kopp, Director, Professor and Extension Specialist
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Joanna Endter-Wada, Director
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The Center for Water Efficient Landscaping (CWEL) is a legislatively established program at Utah State University charged with conducting research and outreach education on landscape water conservation. Landscape irrigation is the single biggest use of water in the urban environment. Our mission is to promote water conservation in the landscape without negatively impacting the quality of life we enjoy in Utah. This session will introduce participants to CWEL, their collaborators, and the programs and information it makes available to water managers and the public. Some of these programs include:

WATER CHECKS. More than 10,000 home water checks (landscape irrigation system evaluations) have been completed with individualized consultations on saving water and money. Average annual water savings of participants in Salt Lake City and Sandy is 88,000 gallons. The program is the largest research-based, individual educational program for outdoor water use in the nation.

WATERMAPS™. Water Management Analysis and Planning Software WaterMAPS™) is an urban landscape water demand management tool. It allows water managers to combine water meter and land use data with weather data to identify locations with capacity to conserve water applied to landscapes. This program aids in analysis of landscape water use patterns and delivery water conservation programs.

WATER SUPPLY IN HISTORICAL CONTEXT. CWEL research in collaboration with the Forest Service, Brigham Young University, and Columbia University has used data from tree rings to reconstruct over 500 years of historic Utah river flows, precipitation, and seasonal water demand, giving state water conservancy districts and suppliers more accurate information with which to manage drought conditions.

WATER CONSERVATION FOR THE LAWN AND LANDSCAPE. This is an online community of practice affiliated with eXtension.org that provides information nation-wide on landscape water conservation.

LANDSCAPE RESEARCH. Researchers in CWEL have published more than 50 peer reviewed research articles covering subjects such as turf and tree water use, native plant production, irrigation equipment, and more. In addition to a website with current information, three books on water conservation in Utah have been published. Specific research topics include:

- Propagation of native plants for low-water landscapes.
- Testing and evaluation of smart controllers for irrigation management.
- Evaluation and development of new turf varieties for low water landscaping.
- Evaluation and estimation of tree water use.
- Estimating overall landscape water consumption.

Participants in this workshop will become familiar with the information and resources offered by CWEL and learn the take-home messages of landscape research programs conducted at Utah State University.

Level: Intermediate

Environmental Crimes, Clean Water Act Enforcement and Teamwork

Ron Lund, Enforcement Coordinator
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Alex Huggard, Criminal Investigator
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This session will provide case studies, statistics and partnerships taken by Salt Lake County Health and the District Attorney's Office to address Clean Water Act violations. The session will provide information about the County's Environmental Crimes Task Force and efforts to reduce environmental violations and impacts. The variety of issues addressed by the Health Departments after hours response team and how to report possible environmental violations during the day and on the Department's 24 hour hotline. Attendees will learn about administrative and criminal enforcement actions to address Clean Water Act violations.

Level: All

Going Native in the Landscape

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The western United States is currently in the throes of a record drought with many communities actually running out of water. Fortunately, Utah has avoided the most serious impacts of this drought, but as we experience increasing population demands on water coupled with the vagaries of drought cycles, prudence would suggest that water conservation is more important than ever. One way to conserve water is to use native plants adapted to Utah's environment in our landscaping. Such plants are playing an increasing role in sustainable landscapes that also require fewer resources such as fertilizers. Unfortunately, many native plants are not available in the nursery trade, or if they are available they may only be found as seedling plants grown for the reclamation industry. Such plants are high quality and have a valuable role in the reclamation of disturbed wildland sites (such as fire-damaged areas). But, these plants by design are genetically diverse and have not been selected for horticultural traits such as flowering or fall color. Such diversity may also be unacceptable to consumers who are looking for a specific size or color of plant to use in their landscape. A mission of The Center for Water Efficient Landscaping and the Utah State University Botanical Center is the selection and development of native plants for use in water conserving landscapes. This program has focused on selecting superior plants, developing production methods that are commercially viable and retain desirable characteristics, evaluating plants in a nursery and/or landscape environment, and releasing plant materials for use by the consuming public. An example of this program is the development of the native canyon or bigtooth maple (*Acer grandidentatum*) for landscape use. Since the turn of this century, we have aggressively searched for

maples with superior form, fall leaf color, and pest resistance. Selected trees have been established in a nursery environment by grafting buds on to seedling bigtooth maples. Once growing in the nursery we have been able to develop alternative means of propagation that allow the trees to remain true-to-type and uniformly demonstrate the characteristics they were selected for. These trees are now being evaluated in Utah and Idaho to determine if they will be effective in a landscape environment. In addition to woody plants, selections of herbaceous flowering perennials have been carefully screened for uniformity and superior performance. This program has already resulted in the recent release of 'Sol Dancer' sundancer daisy (*Tetraneuris acaulis v. arizonica '*Sol Dancer') and 'Wasatch Fire' firechalice (*Epilobium canum* 'Wasatch Fire') for production and sales in Utah. Participants will become familiar with the wide range of native plants being developed at Utah State University including selections of mountain mahogany, round-leaf buffaloberry, creeping Oregon grape, and single-leaf ash in addition to firechalice, sundancer daisy, and bigtooth maple. Characteristics of the plants, their native environments, methods of selection and propagation, nursery production requirements, and their use in the landscape will be discussed.

Level: Intermediate

In Accord with Our Watersheds

Panelists

Laura Briefer, Water Resources Manager
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Ann Ober, Senior Policy Advisor
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Moderator

Stacey Arens, Chemical Engineer
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A critical correlation exists between the health of the environment system within the central Wasatch Mountains and the ability of Mountain Accord communities to maintain public health, quality of life, and a sustainable economy. It is because of the surrounding mountains and natural areas that communities have clean water, areas to recreate, and ways to attract businesses to and grow the economy in Utah's most populous region. However, population growth, development, increased use as well as climate change increase the stress on the natural systems and potentially impact watershed health, drinking water quality and quantity, ecosystems, habitat, and air quality. Mountain Accord seeks to make long-term decisions regarding the future of the central Wasatch Mountains. One key component of the future of the central Wasatch Mountains is protection and restoration of watershed health and drinking water. The key points of discussion include: (1) the process followed to develop consensus on goals for protection and restoration of watershed health and water quality and quantity, (2) the actions identified by the Mountain Accord environment working group to improve the overall health of the watershed and the ecosystems and habitats it supports, and (3) potential compromises to the identified actions that accommodate other interests (recreation, economy, and transportation).

Level: Introductory

Innovative Tools for Water Education

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In this session, participants will learn about two educational efforts designed to help Utahns better understand our collective relationship with water quality, use, consumption, and its impact on our communities. The first effort, BluePrint Utah, is a regionally-specific, interactive water footprint calculator which can help Utahns better understand their water use and how it is connected to Utah's future. It was developed by the Utah Rivers Council in partnership with the U of U Office of Sustainability in an effort to institute permanent water conservation and sustainable water use practices at the University of Utah and across the state through a mixture of education and technology. The second is an innovative art-meets-science, high school curriculum that introduces students to the environmental movement, and the past, present and future of the Jordan River corridor. Over the course of an 8-week residency, students explore the river and their own communities through photography, creative writing, science experiments and hands-on restoration efforts. The experiences and work of the students and other community members is then presented in a new digital trail guide for the Jordan River Parkway, called My Jordan River. The web app can be accessed on any smartphone, tablet or computer and encourages members of the public and other agencies to share their own announcements, updates, photos and stories.

Level: Introductory

iUTAH: Enabling Sustainable Water Systems for Utah

Panelists
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Moderator
Michelle Baker, Project Director iUTAH EPSCoR
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iUTAH (innovative urban transitions and arid-region hydro-sustainability) is an interdisciplinary research and training program focusing on Utah's water resources now and into the future. In the first two years of the project, iUTAH built an environmental observatory to make measurements of the water balance and water quality in the Logan River, Red Butte Creek, and Middle Provo River Watersheds. Additionally, iUTAH social scientists defined a neighborhood typology of the Wasatch Front and conducted interviews of more than 3000 households. iUTAH engineers are exploring ways that green infrastructure can be used to better manage urban water. These data collection efforts will be synthesized in coupled models, and will be made available free, online, for any user. In this panel, we will summarize these efforts and open discussions with the audience for how iUTAHs efforts can be directed to meet different stakeholder needs for Utah's water future.

Level: Introductory

Late Breaking Headlines from the Stormwater News & Gazette

David Hirschman, Program Director
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Stormwater management has changed quite dramatically across the country in recent years. What national trends are likely to influence the practice in Utah in coming years? How much credit can you get for your nifty retrofit project? Will stormwater finally be accepted into the infrastructure country club? Why are regulations hoping that stormwater will just go away? Can you trade away your stormwater requirements to the highest (or lowest) bidder? This presentation will address these and other mouth-watering stormwater topics.

Level: Introductory

Mountain Accord: Harmony or Noise?

Patrick Shea, Citizen/Professor
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The Mountain Accord is moving on a very fast time schedule to "plan" for the Central Wasatch for the next thirty years. My presentation will discuss who the players, are they are seeking, why and will they succeed?

Level: Intermediate

Nutrients in Great Salt Lake Wetlands: Fluxes and the Role of Microbes

Scott Teeters, Graduate Student
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The Farmington Bay Wildlife Management area is a controlled bird refuge that receives water from the often nutrient-rich Jordan River. The area encompasses 18,000 acres and is an important migratory location for hundreds of avian species. Farmington Bay can be classified as an impaired wetland as eutrophication flourishes in much of the bay. Moreover, little is known about how the wetlands remediate any incoming nutrients. As a result, the EPA released a "Request for Proposal" that encouraged researchers to conduct experiments to investigate the causes, reduction and elimination of water pollution. In addition, the Utah Division of Water Quality (UDWQ) is interested in developing more representative water quality assessment tools for the wetlands to determine additional information on "internal-external" nutrient loads. This study is a collaborative effort with UDWQ in response to the EPA's request for proposals to determine the source of nutrient pollution in this area and to characterize the biological processes responsible in the nutrient cycle of the wetlands. Nine wetlands are being studied in the course of this

analysis- seven are located in Farmington Bay Wildlife Management Area while the remaining two sites are found in land owned by Ambassador Duck Club and Bear River Nature Preserve. To determine the source of nutrients and identify bacteria involved, several tests must be completed in conjunction to better explain these wetlands' processes. First, nutrient flux sampling events are carried out for every site. These involve comparing nutrient concentration changes over time in water isolated from its surrounding environment to water in contact with sediment. Each sampling also included sediment sampling to be used for serum bottle tests and biomolecular analysis. Serum bottle tests involved exposing sediment to nutrients and monitoring the nutrient concentrations over time to develop a rate for nitrification and denitrification. Nitrification serum bottles containing sediment were spiked with a known concentration of ammonia and analyzed before and after a twelve hour period. These results were compared to samples without ammonia spike to consider how much more ammonia the sites can nitrify. In addition, multiple denitrification serum bottle tests were completed using varying amounts of acetate and nitrate to determine if the denitrification occurring in the sediment is nitrogen limited or carbon limited. Last, the results of the nutrient flux studies and serum bottle tests were compared to bacterial DNA analysis of each site. DNA was extracted from the sediment of each site and nitrification, denitrification, anaerobic ammonia oxidation, and dissimilatory nitrate reduction to ammonium. Gene amplification and identification were completed via PCR and gel electrophoresis. In addition, real time PCR analyses were carried out to quantify some important genes involved in nitrification and denitrification, such as AmoA, nirK, and nirS. TRFLP of AOB and NOB concluded the bacterial analysis of each site. Results from the nutrient flux study, serum bottle tests, and microbial analysis were combined to get a clearer picture of the nutrient dynamics of the Farmington bay wetlands.

Level: Intermediate

Our Watershed in 2050? The impact of adding 2.5 million people to the Wasatch Front and Back?

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Enough Water for Our Needs. Utah is one of the driest states in the nation. Our water is precious, and developing new supplies will cost billions of dollars. We simply can't afford to keep using as much water as we have in the past if our children, grandchildren, and new neighbors are to live here with us. In the late 1990s, when Envision Utah did its first large visioning effort, the average person in the Greater Wasatch Area used 319 gallons of water per day. Since that time, we've cut our water consumption by 25%, so that we now use 241 gallons per person. That's a savings of trillions of gallons per year. If we hadn't reduced our water use per person, we would use have had to spend more money on infrastructure, like water storage, treatment, and transmission. How did we achieve this? First, we've started using less land for our new houses, with smaller lot sizes, which means less outdoor watering. Second, we've been smarter about when and how we use our water. As we add another 2.5 million people by 2050, we will need to decide whether we will cut our water use even further—and how we can do so—or figure out how we can afford to spend a lot of money on new infrastructure to bring in water from far away. Join us as we discuss water issues within the context of our current Your Utah Your Future project and lend your voice as to how we ensure we have enough water for our needs in 2050.

Level: Introductory

Protecting Great Salt Lake: Meeting the Water Quality Challenge

Jodi Gardberg, Great Salt Lake Water Quality Coordinator
Utah Division of Water Quality, Salt Lake City UT
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Under both state law (UAC R317) and federal Clean Water Act authority, the Utah Division of Water Quality (UDWQ) is entrusted with the responsibility of protecting the Great Salt Lake's "designated uses"— water quality necessary for the protection for waterfowl, shorebirds and other water-oriented wildlife including their necessary food chain and for recreational activities such as swimming and boating. Yet the extent that the Lake is resilient to or threatened by pollutants and the effect of pollutants on the Lake's designated uses is difficult to determine. Great Salt Lake's unique characteristics, particularly salt concentrations that range from freshwater to concentrations tenfold greater than the ocean, require creative approaches specific to the Lake. In 2012, UDWQ launched the Great Salt Lake Water Quality Strategy designed to develop numeric water quality criteria, improve water quality monitoring and prioritize research. Come learn about the current water quality activities carried out per the directives of the Great Salt Lake Water Quality Strategy.

Level: Intermediate

Research, monitoring, and recovery projects on Utah Lake and the Utah Lake/Jordan River transition zone

Panelists

Hilary Arens, Utah Lake & Jordan River Basin Coordinator
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Eddy Cadet, Associate Professor
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Michael Mills, Coordinator
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Weihong Wang, Assistant Professor
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Moderator

Suzanne Walther, Assistant Professor
Department of Earth Science
Utah Valley University
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This panel brings together several academic and agency researchers working on different aspects of Utah Lake and/or the Jordan River headwaters. Brief presentations will cover 1) an iUtah funded research project that investigates anthropogenic impacts on Utah Lake and its surrounding wetlands using stable isotope, trace metal, 210Pb and 14C dating, and sediment particle distribution analysis; 2) research and recovery actions to improve the status of the endangered June sucker, an endemic species found in Utah Lake and its tributaries (JSRIP); and 3) an overview of watershed protection via water quality and invasive species monitoring on the lake. Subsequent discussion will answer questions about these current projects and discuss possible future developments and the relationships between these diverse types of projects and their importance in the understanding and rehabilitation of the Utah Lake watershed and its ecosystem.

Level: Intermediate

Securing Future Water Supplies within the Great Salt Lake Watershed

Panelists
Laura Briefer, Water Resources Manager
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Robert Davies, Research and Education Associate
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Daniel McCool, Director Environmental and Sustainability Studies
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Jeff Salt, Executive Director
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Moderator
Alan Matheson, State Planning Coordinator/Senior Environmental Advisor
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Utah is the second driest and third fastest growing state in the United States. Most of the state's population, over 80%, resides within the Great Salt Lake watershed region, mostly concentrated along the Wasatch Front. Significant population growth is projected throughout the basin during the next 20 years, with watershed-wide population predicted to nearly double by the year 2050. To effectively meet future water needs, water planners and managers throughout the Great Salt Lake watershed region will need to do more than simply provide adequate water supplies and delivery systems. Consequently, local water providers must investigate a variety of alternatives to improve their capabilities for meeting future water demand. Adaptive strategies are also needed that reflect improved knowledge and information, changes in natural and environmental conditions, shifts in public policy and legal paradigms, fluctuations in population and economic growth patterns, and the evolution of socio-political issues. Generally speaking, water supplies throughout the Great Salt Lake watershed region are adequate to meet projected future demand for the next 20 years. Water has been made so readily available, that its relative scarcity is often overlooked. This reality must be fully recognized and appropriate decisions made in order to provide sufficient water for the basin's future population growth. Despite extensive water infrastructure, recent severe droughts have strained water supplies throughout the watershed, creating significant challenges for water planners and managers who must secure sufficient water supplies to meet increasing demand caused by population growth and economic expansion. A significant challenge for water providers is understanding the long-term hydroclimatology of the watershed region, which is complex, and characterized by variability and considerable uncertainty. Another important challenge for water resource planning is modeling climate change and developing adaptive strategies for securing future water supplies. Climate change is predicted to reduce regional water availability and intensify the effects of droughts and their impact on communities throughout the watershed. Climate models predict the western US will experience increased temperatures, changes to rain and snowpack levels, and more severe and longer duration droughts, all of which will affect the capacities of watersheds to sustain projected population and economic growth. In securing future water supplies, water providers must also address the impacts to the natural environment that result from increased water development, including changes in water quality, impacts to wildlife, and habitat modification. Water planners and managers

must also deal with many socio-political issues as they emerge. This panel will provide attendees with a better understanding of the complex challenges that water providers and community leaders face in securing future water supplies within Utah's most populated watershed. More specifically, attendees will learn about: 1) current scientific research regarding the long-term hydroclimatology of the Great Salt Lake watershed and the potential effects of climate change on future water supplies; 2) current efforts by water providers to develop long-range plans and strategies for meeting projected demand and securing future water supplies within the Great Salt Lake watershed; 3) alternatives to water development projects for securing future water supplies; 4) the role of public policy, water law and sustainable economics in securing future water supplies throughout the Great Salt Lake watershed; 5) environmental impacts associated with water development and consumptive uses throughout the Great Salt Lake watershed; and, 6) socio-political issues regarding water development within the Great Salt Lake watershed.

Level: All

Stormwater Programs in Utah: What the Managers and Operators Think

Andrea Armstrong, Graduate Student Sociology
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Steve Burgon, Stormwater Programs Supervisor
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Extensive Research has addressed the engineering of stormwater, but very few studies consider the experiences and management obstacles that stormwater managers encounter. Our presentation will highlight findings of a recent statewide survey, sponsored by the Utah Stormwater Advisory Committee, of Utah stormwater managers from municipal, construction and industrial sectors. We describe the biggest challenges facing these stormwater programs, and outline different strategies that managers can use to address permit requirements.

Level: Intermediate

Utah at the Crossroads: Climate Change Impacts to our Watersheds

Zach Frankel, Executive Director
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This interactive presentation looks at the impacts of climate change upon Utah's watersheds, by exploring what the chorus of science is telling us about Utah's water future. In Utah's third year of drought we explore the impacts of what sustained periods of reduced water-availability mean for Utah and the entire Colorado River Basin. We also examine not just future impacts caused by climate change, but strategies and policies that can make those impacts less severe upon our communities and our ecosystems. Warming temperatures are causing a cascade of impacts upon Utah's watersheds and the many economies they support. With over 80% of the water used along the Wasatch Front coming from snowmelt, the fate of rising temperatures will affect both those who believe climate change is real and those who don't. We examine not only the science of climate change and its impacts upon our snow and water resources, and how the policy and economics governing the management of our watersheds will affect this future. For those who know climate change is real, this workshop will offer substantive suggestions about what to do about the impacts posed to Utah's watersheds. The URC spent two years studying climate change impacts on Utah and researched hundreds of scientific journal articles, climate reports as well as popular media stories. We interviewed scores of researchers from a variety of disciplines, studied climate adaptation plans from other states and regions and carefully documented proactive solutions that other communities

implemented to address climate change and its impacts. This workshop is designed for laymen interested in learning how climate change will impact Utahns and the watersheds and ecosystems they revere. It has been presented to a variety of audiences and focuses on positive change and removing some of the fear of the future while focusing on the need to act proactively for current and future generations. Come learn how to engage your fellow residents to do something about climate change, without realizing that's what they're doing. Topics covered include observed climate impacts, water policy, habitat losses, adaptation strategies and tools to collaborate with other audiences in socially conservative Utah.

Level: All

Water Flows through the City: Planning Perspectives

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From high in the mountains above Salt Lake City, water flows through rivers, creeks, and reservoirs to reach the city. Once in the city, water is used by households, wildlife, manufacturers, businesses and farms. After it is used, water flows down pipes, ditches, and streams until it reaches the Great Salt Lake. Our presentation at the Salt Lake County Watershed Symposium focuses on four investigations into the flow of water through the city. We take insights from these investigations and present planning perspectives on water supply and demand, current use, and stormwater management. Starting with the initial flow of water from high in the mountains, we investigate our city's water supply. We will present system dynamic models that describe, simulate, and predict our water supply. When coupled with models of water demand, we explore planning strategies to maintain our current water supply and to respond to increasing demand for water in the future. Our second investigation presents a current picture of our water consumption in Salt Lake City. Data visualizations and trend analysis allow us to assess when, where, and how water is used in Salt Lake City. Planners can utilize this information to understand the driving factors of water use that are within their realm of influence. Of particular interest to planners will be how the built environment affects water use. We identify certain characteristics of the built environment that are associated with higher water use. At the same time, we investigate the role that individuals and their attitudes play in urban water consumption. We contrast the effects of individual attitudes with the effects of built environment to identify whether it's the people or the building that determines how much water is used. The implications of these findings are important for planners. If it's the people that determine water use, education will be critical to achieve conservation. If it's the buildings that drive water use, there are design standards that can be implemented to achieve conservation. Finally, after the water washes down the sidewalks, into storm drains, and away from parking lots, we explore what to do with our stormwater. Thinking about stormwater as a water resource, rather than a nuisance or hazard, we will discuss the possibilities and challenges of implementing green stormwater infrastructure across the city and report

on current research activities. Can green infrastructure capture and treat all the stormwater in the city? Based on of experiments at the University Campus, and a nationwide network of Green Infrastructure, we will present a set of "best practices" that planners can implement in Salt Lake City. As our region looks forward to years of growth and expansion, a critical and thorough understanding of how we use water is essential. Both planners and general audience members will engage in discussions about our water flows and systems through presentations given by University of Utah students and faculty.

Level: Intermediate

We Just had a Fire in the Watershed, Now What?

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Catastrophic fire is becoming more common throughout the western United States. The fire season is starting earlier, lasting longer, and, in some cases, doesn't seem to end! This combined with extreme events, such as intense rainfall, and earlier and quicker spring melt can create a "perfect storm", causing a watershed to simply wash away when the rains do come. The lack of vegetation and the ease of sediment transport on post-fire landscapes can cause 1- and 2-year rainfall events to cause devastation equal to 100- and 200-year events! In the West, the fire season is followed closely by the wet season, so on-the-ground responses must occur immediately to forestall drastic sedimentation loss. As of August 1, 2014, there have been 769 fires in Utah, about half man caused and about half lightning caused. According to Utah Fire Info, these fires have burned about 28,000 acres this year, again about half man caused and about half lightning caused. Much of this burned area is located in Utah watersheds. These watersheds provide water for many thousands of people throughout the state, habitat to the diverse flora, fauna, and animals that help to make our state a destination for recreation-based tourism, and water and feed for Utah's many ranches. Due to the fuels buildup of the last century and climatic trending, catastrophic fires aren't 100% avoidable, but we do have control over the method and speed of our response to these events. Current practice in post-fire restoration is to look at the watershed as a whole. Rather than replanting pine on 5-foot centers throughout the burn area, we will present alternative restoration strategies that provide the necessary immediate response as well as a thoughtful approach to watershed-scale habitat and hydrologic requirements. This presentation will feature a case study of two 2012 wildfires in Sanpete and Utah Counties, and the response to these catastrophic events. The discussion will provide valuable insight that can be used to evaluate the magnitude of damages caused by a fire, as well as fire effects and methods of remediation. Findings will include a discussion of fire effects on soils, increased runoff issues, decreased watershed production, and erosion and deposition problems. Remediation will include a timeline for watershed recovery, sizing of infrastructure, planting plans, and ongoing maintenance requirements.

Level: All

Win, Win, Win! Jordan River Bird Monitoring through Citizen Science

Peter Woodruff, Citizen Science Project Assistant
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Rachel LeBlanc, Project Volunteer
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Projects aimed at enhancing riparian habitat quality are occurring along the Jordan River; how can citizens and managers take part in ascertaining the success of these important projects, collectively? Volunteers from the community are engaging in the monitoring and data-collection process through citizen science, bringing their local knowledge, gaining exposure to rigorous scientific protocol, and benefiting the habitat in an enriching three-way exchange. Tracy Aviary's Citizen Science Project utilizes standardized bird survey methods that allow analysis of bird populations over time, and an interpretation of ecological responsiveness to local management actions. Collaboration between volunteers, researchers, and land managers generates a positive participant experience and useful data for the Jordan River conservation community: a win, win, win! Volunteers and staff of Tracy Aviary's Citizen Science Project conducted surveys at three sites along the Jordan River. The locations include: the Jordan River Migratory Bird Reserve (110 acres) owned by Great Salt Lake Audubon; Galena/Soo'nkahni Preserve (~250 acres) managed by Utah Open Lands; and Big Bend Habitat Restoration Area (80 acres) within the City of West Jordan. Following field trainings and a compilation of breeding-season bird surveys (April to July of 2014) a preliminary analysis shows a total of eighty-seven bird species recorded at the three sites. In this breakout session we will share about both the Citizen Science volunteer experience and the results gathered, including comparisons among surveyed habitats. We anticipate enjoyable stories, and that the data will provide guidelines for future habitat management along the Jordan River corridor, coinciding with the Jordan River Blue Print and its guiding Best Management strategies.

Level: Intermediate

Field Trips

Jordan Basin Water Reclamation Facility Tours

Trip Leaders:
JBWRF Staff

The Jordan Basin Water Reclamation Facility (JBWRF) utilizes state-of-the-art membrane technology to maintain the ever improving standards of water quality in Utah. GE Zenon technology allows the JBWRF to produce water that is ready for use in secondary irrigation systems. Ultra-violet light is also used as a safe means of disinfection of all the water that passes through the facility. Construction accounted for future growth, eliminating the need for costly expansion in the near future.

Level: All

iUTAH Activities in the Red Butte Watershed

Jim Ehleringer, Distinguished Professor of Biology
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Brenda Bowen, Associate Professor of Geology | brenda.bowen@utah.edu
Dave Eiriksson, GAMUT Technician, iUTAH EPSCoR
Steven Hall, Research Assistant Professor, iUTAH EPSCoR
Christine Pomeroy, Associate Professor of Urban Water Engineering & Sustainability Group
Allison Chan, Ph.D candidate, Department of Biology
Olivia Miller, Ph.D candidate, Department of Geology and Geophysics

The field trip will start with an overview of the Red Butte Research Natural Area (RNA) including iUTAH research in the RNA, and the June sucker recovery program in the Red Butte reservoir. Will also

discuss ongoing University of Utah research in the Red Butte Creek watershed, including: stormwater management and monitoring, water quality and aquatic monitoring, box elder stream ecology experiment, bioretention systems, and University of Utah revitalization of Red Butte Creek.

Level: All

Bios

Zach Aanderud is an Assistant Professor in the Plant and Wildlife Sciences Department at Brigham Young University. His research interests are in microbial and ecosystem ecology.

Carl Adams, Erica Gaddis and Jim Harris manage the Watershed Protection, Water Quality Management, and Monitoring sections for the Utah Division of Water Quality, respectively. These programs all fulfill Clean Water Act Section 303(d) requirements to monitor, assess and restore Utah's streams and lakes. Collectively they share over 40 years of experience and draw upon their diverse educational and professional backgrounds to address the challenges we face for water quality in Utah. They are committed to working together, and in cooperation with our federal, state, and local partners to protect our most vital resource for many years to come.

Richard Anderson is the Utah State University Botanical Center's nursery and greenhouse manager and oversees the plant introduction program. He resides in Malad, Idaho where he is busy raising kids, plants, and alpacas. He loves history and thoroughly enjoys spending time scouring the mountain terrain in search of the next botanical beauty.

Hilary Arens has worked for the Utah Division of Water Quality in Watershed Protection since 2008, where she helps to manage water related projects in the most populated watersheds in Utah. She has a Masters degree in Watershed Science from Colorado State University where her thesis focused on qualities in the planning process that lead to successfully implemented watershed plans. Before the DWQ, she worked in the private sector on NEPA requirements relating to water and biological resources. Prior to Utah, Hilary lived in Anchorage, Alaska where she split her time between working for the Municipality of Anchorage, writing the first watershed plan for the State of Alaska, and the Anchorage Waterways Council, a local non-profit organization where she worked on community watershed outreach and education. She is currently on the Board of Directors of the River Network, a national organization whose mission is to protect water resources through the support of locally-led river and watershed groups. Outside of work, Hilary is an avid boater, skier and cyclist, leading her and her husband to bring their toddler twins on adventures where few toddlers go.
Stacey Arens is an engineer with 19 years of experience in the treatment and restoration of contaminated soils, water, and air. On Mountain Accord, she lead the water sub-group in gaining consensus on vision, goals, metrics, and actions for the health of the central Wasatch Mountain watersheds and drinking water.

Andrea Armstrong is a graduate Student in Sociology at Utah State University. She conducts research on local water management.

Michelle Baker is professor of Biology and an Associate of the Ecology Center at Utah State University. She directs the iUTAH EPSCoR project.

Dave Bastian is the program coordinator for the Utah Conservation Corps (UCC), Utah's largest AmeriCorps environmental program. The UCC conducts conservation projects on lands across the state of Utah, training the next generation of conservation leaders. The UCC tackles trail projects, habitat restoration, and fire mitigation and has worked with project sponsors on the federal, state and municipal level. Prior to coming to the UCC, Dave was the Director of Operations at Save Our Canyons and the Membership and Outreach coordinator for the Utah Rivers Council. When not at work, Dave spends his time riding his bike, playing mandolin, backcountry skiing, climbing, or sitting in a chair reading with his daughter.

Lowell Bodily Ricks College Rexburg Idaho; Utah State University, BS; University of Utah Masters work. Upon graduation from USU, he ran a mosquito abatement program for Logan City for 2 years. From 1964 to present, Mr. Bodily has worked for the Salt Lake County Health Department. He has worked in almost every areas of the Division of Environmental Health. He ran a survey for the U.S. Public Health Service and while in that capacity, helped staff the methadone program. He worked in the Bureau of Food Protection doing restaurant inspections and in the Bureau of Water Quality doing pool inspections. He is currently working in the Bureau of Sanitation & Safety where one of his assignments for the last twelve years has been the has been working with the community clean-up program, dealing with transients and illegals encampments in Salt Lake County. Mr. Bodily has been married for 56 years. He has four Children, 16 grandchildren, 3 great grandchildren. He likes to play golf, hunt, fish, and with grandchildren in their various activities.

Brenda Bowen is Associate Director of the Global Change and Sustainability Center and an Associate Professor of Geology at the University of Utah. Her research interests are in sedimentary geology. Brenda has led the effort to establish the stretch of Red Butte Creek passing through the UU campus as a biological preserve and she coordinates coursework, research, and outreach activities related to Red Butte Creek on the UU campus.
Laura Briefer is the Water Resources Manager for Salt Lake City Department of Public Utilities (SLCDPU), a municipal water supplier responsible for the provision of drinking water to more than 349,000 people in the Salt Lake Valley of Utah. Laura has worked at SLCDPU for the past six years, and has 20 years experience in natural resource and environmental professions in the public and private sectors. She has a degree in Environmental Studies from the University of California at Santa Barbara, and a Master of Public Administration from the University of Utah. Laura spends much of her free time running, cycling, and skiing in the Wasatch foothills and mountains with her husband and two children.

Martin Buchert is a Senior Research Analyst and adjunct faculty member in the department of City and Metropolitan Planning at the University of Utah. Utilizing expertise in GIS, data visualization, and remote sensing, Martin investigates urban water use, green infrastructure, and transportation systems.

Steve Burgon is a Supervisor in Hydrology and Stormwater Programs for Salt Lake County Flood Control. He was Chair of the Utah Stormwater Advisory Committee in 2013.

Eddy Cadet is an Associate Professor in the Department of Earth Science at UVU. Eddy specializes in teaching Introduction to Environmental Health, Occupational Worker Safety, Hazardous Materials and Emergency Response, Hazardous Materials Regulations, Environmental Toxicology, Resource Conservation and Recovery, Site Investigation, Landuse Planning, Environmental Compliance, and Environmental Management. He is researching PCB and trace element levels in soil, plant and fish in Utah Lake.

Allison Chan is a Ph.D. graduate student in the Department of Biology at the University of Utah. She received her undergraduate degree in Biology from Bowdoin University in 2011. Her research focuses on the transpiration of trees and its relationship to adaptation and stress in forests of the Wasatch Mountains. She is a member of the iUTAH team and works under the supervision of Fr. David Bowling.

Kerry Cramer Bachelor Degree University of Colorado-Boulder 1974, Environmental Biology
Employed by Salt Lake County Health Department 1974-present. Duties have included food inspections, pool inspections, personal services (cosmetology, body art, massage, tanning) inspections, school inspections, solid waste/housing inspections. chemically contaminated properties (meth houses).
Member Plumbing Advisory Committee, State of Utah 1988-present; Member Uniform Building Codes Commission 1999-207; Level II Backflow Technician; Licensed Environmental Health Scientist.

Robert Davies is a physicist, educator and Associate of the Utah Climate Center, where he does both climate research and works as an extension climatologist, helping translate up to date climate and climate change research into useful knowledge for Utah's people, businesses and policymakers. Dr. Davies has served as an officer and meteorologist in the U.S. Air Force, worked for NASA on the International Space Station project, and taught on the faculty of three universities. His published scientific research has included interactions of spacecraft with the space environment, the

fundamental physics of light and information, and Earth's changing climate. For the past seven years, Dr. Davies' work has focused on communicating the science of climate change, energy and sustainability.

Jim Ehleringer is a Distinguished Professor of Biology at the University of Utah and director of Utah's Global Change and Sustainability Center. Jim's ecological research melds stable isotope analyses with process studies to understand carbon and water cycles, air quality, biomarkers, humans, and our foods.

Dave Eiriksson is a GAMUT technician at the University of Utah for the iUTAH EPSCoR Project. In this capacity, he oversees all aspects of developing and maintaining the aquatic and terrestrial monitoring sites within the Red Butte Creek Watershed. He earned a B.S. Degree in Geology from the University of Puget Sounds and a Masters Degree in Hydrological Sciences from Boise State University.

Joanna Endter-Wada has engaged in long-term interdisciplinary collaborations that integrate water–related policy and social science (her specialties) with plant science, irrigation engineering, and remote sensing to analyze urban landscape water use and promote conservation. She employs multi-method data collection, analysis, and synthesis and utilizes interviews, surveys, focus groups, mapping, and experimental research procedures. She and CWEL colleagues work with local water utilities and conservancy districts and have developed a software application (WaterMAPS™) for use in urban water management (see: watermaps.usu.edu). Research funding has come from the USDA, Bureau of Reclamation, Western Water Assessment, Utah Agricultural Experiment Station, and water providers.

Courtney Flint is Associate Professor of Natural Resource Sociology in the Sociology, Social Work, and Anthropology Department at Utah State University. Her research focuses on socio-ecological interactions and stakeholder alignment in communities and landscapes.

Zach Frankel received his B.S. in Biology at the University of Utah and is the founder and Executive Director of the Utah Rivers Council which was started in 1995. After starting the Rivers Council, Zach led the organization in a campaign to stop a proposed 260 foot high dam on the Diamond Fork River that had been proposed as part of the Central Utah water Project. Zach also drafted Utah's first water conservation legislation, the Utah Water Conservation Plan Act, which was passed in 1998 by the Utah State Legislature. Zach also led a 3 year campaign with farmers, ranchers and taxpayer advocates to remove two proposed Bear River dams from the Bear River Development Act. In 2002, this legislation passed the Utah Legislature unanimously on every vote but one, which was 68 to 2 in favor. Zach left the Rivers Council in 2003 and worked in the film and television industry for 5 years before returning to the organization in 2009. His first successful campaign upon returning saw the permanent protection of a 3,000 year old Native American Village adjacent to the Jordan River which had been slated for a sprawling complex of industrial towers and offices.

Erica Gaddis [see Carl Adams]

Jodi Gardberg is the Great Salt Lake Water Quality Coordinator for the Utah Department of Environmental Quality, Division of Water Quality (UDWQ). In this capacity, she coordinates UDWQ activities pertaining to the Lake including development of numeric water quality criteria, monitoring, assessments of the open water and wetlands, as well as Utah Pollution Discharge Elimination System permit and 401 water quality certification planning. In addition, she provides staff support for the legislatively appointed Great Salt Lake Advisory Council.

Erfan Goharian is a PhD student in Civil and Environmental Engineering at the University of Utah. His research focuses on integrated water resource management, system dynamics modeling, climate change impact on water resources, and the development and application of simulation/optimization methods.

Jerry Goodspeed is a Horticulture Associate Professor for Utah State University Extension in Weber County, Utah, and directs the USU Botanical Center in Kaysville and the Ogden Botanical Garden. He and his wife reside in Kaysville and enjoy spending time with their children and grandchildren. He is also know for his dry wit and humor that he finds in just about any situation.

Robert Grow holds degrees in engineering and law from the University of Utah and the J. Reuben Clark Law School at Brigham Young University and has had a diverse career, including practicing law, leading and supporting regional visioning processes, being president of a large manufacturing company, and chairing a national trade association. He was the primary architect of Envision Utah's grass roots, bottom up, stakeholder driven, values based approach. For his role in helping shape the strategy for the Salt Lake region's future transportation system, Robert received the American Public Transportation Association's (APTA) Distinguished Service Award in October 2003. Over the last couple decades, Grow has developed an expertise in facilitating regional stakeholders in creating multi-generational visions for major metropolitan areas of the United States and has worked with more than 80 metropolitan regions. Robert led the visioning teams for San Diego; Laie, Hawaii; and the 175,000-acre Superstition Vistas property in Arizona and played a significant role in the Traverse City, Michigan and Southern Louisiana visioning processes. In addition, he led the Utah-based team of O'Melveny & Myers LLP dealing with the full spectrum of legal issues relating to environment, planning, entitlement, infrastructure, and development for Kennecott Land Company's 93,000-acre land holding on Salt Lake's West Bench plan, as well as the 4,000-acre Daybreak Community, Kennecott Land's first model sustainable community.

JayDee Gunnell is a Horticulture Associate Professor for Utah State University Extension and Director of Salt Lake County Extension. He also oversees the arboretum development at the Utah State University Botanical Center. He resides in Layton, Utah with his wife and four children. He enjoys any activity that finds him out of doors.

Steven Hall is a Research Assistant Professor at the University of Utah associated with the iUTAH EPSCoR Project. His research is in biogeochemistry of natural and urban ecosystems, particularly in studies of nutrient dynamics and trace gas fluxes. He earned his Ph.D. from UC Berkeley and is currently a part of the Bowling Lab at the UU

Laura Hanson, AICP is the executive director of the Jordan River Commission. The JRC is a voluntary cooperation of three counties, ten cities, two special service districts and dozens of community partners working together to implement an ambitious vision for the 50-mile long Jordan River corridor. Laura has applied her thirteen years of professional planning experience to her position with the JRC, and is now enjoying the tangible work of implementing plans for the Jordan River. She holds bachelor degrees in urban planning and environmental studies, and a Master of Urban Planning degree from the University of Utah.

Jim Harris [see Carl Adams]

Sarah Hinners is a landscape and urban ecologist. She holds a B.A. in Geography and Environmental Studies from McGill University and a PhD. in Ecology and Evolutionary Biology from the University of Colorado, Boulder. As a scientist in a planning department, she sees her role as bridging the gap between research and real-world applications. As Acting Director of the Ecological Planning Center, she works closely with natural scientists, engineers, planners and community partners to find innovative ways to build cities that are economically, socially and ecologically healthy, functional, resilient and equitable. She teaches Principles of Ecology for Planners in the Urban Ecology core curriculum.

David Hirschman has over 30 years of experience with stormwater and water resources management. His career spans the public, private, academic, and non-profit sectors. Notably, he managed the stormwater program for a local government in Virginia, taught water resources courses at Virginia Tech and the University of Virginia, and has led numerous trainings and workshops across the country and in the Pacific. David serves as a Program Director and Virginia office director for the Center for Watershed Protection, coordinating local government, state, and territorial programs. He is the primary author of Managing Stormwater in your Community, a national EPA guide on developing local stormwater programs. David has a B.A. in Biology from Duke University and a Master of Urban & Regional Planning from Virginia Tech.

Jeff Horsburgh is an Assistant Professor in Civil and Environmental Engineering at Utah State University. His research interests span watershed hydrology, surface water quality, and environmental information systems.

Marian Hubbard-Rice joined the Salt Lake County Engineering Division, Watershed Planning and & Restoration Program in 2007 as a Watershed Scientist and Planner. She has a Bachelor of Science Degree in Biology from Portland State University, a MPA in Natural Resource Management from University of Utah, and currently working on a Ph.D. at University of Utah. Marian's core responsibilities include, but not limited to, collaboration with agencies, local stakeholders, and the general public; writing, updating and implementing the Salt Lake Countywide Water Quality Stewardship Plan (WaQSP); performing ecosystem restoration; and water quality monitoring in the Jordan River Watershed. Prior to the County, Marian worked in the Portland, Oregon Metro area in environmental management. After which she moved to Utah to work with the U.S. Forest Service performing ecosystem restoration in the beautiful Strawberry River Watershed.

Alex Huggard Since 2010, Sgt. Huggard has been assigned to the Environmental Crimes Unit of the Salt Lake County District Attorney Office. The Environmental Crimes Unit is a multi-agency collaboration with the Salt Lake County Health Department and all City, County, and Federal agencies investigating environmental crimes. Since 2010, the Environmental Crimes Unit has investigated and criminally charged more offenders than in the previous 15 years combined. Experience; 1974-1977 Park City Police Department; 1977-2001 Murray Police Department; 2001-2014 Salt Lake County District Attorney's Office/Environmental Crimes Unit. Training & Expertise: 40 years experience as a law enforcement officer; 4 years as a K-9 office; 2 years on Murray S.W.A.T.; 10 years working undercover narcotics with F.B.I., D.E.A., Metro Narcotics Task Force, fraud investigations, white collar crimes, property crimes, sex crimes, adult and child homicides, arson crimes, officer involved shootings, officer involved critical incidents investigations and environmental crimes …… are just some of the many great assignments he feels he has had the good fortune to be involved; 27+ years as a firearm instructor for handgun, rifle and shotgun; Expert court witness regarding firearms and use of force; Instructor for the Utah State Police Academy regarding undercover narcotics, sex crimes, and officer involved critical incidents and firearms; Instructor for the Utah Police Officers' Association regarding officer involved shootings, documentation of training and use of firearms, and handgun and rifle training.
Current Assignment

Doug Jackson-Smith is Professor of Sociology in the Sociology, Social Work, and Anthropology Department at Utah State University. His research interests include the sociology of agriculture, natural resources, and the environment.

Paul Johnson is a Professor of Turfgrass Science and Acting Head of the Plants, Soils, and Climate Department at Utah State University. His specialty is the development of bluegrass species with increased drought and salt tolerance for better adaptation to Intermountain West environments. His research has been widely funded by the USDA and the United States Golf Association. Dr. Johnson collaborates frequently with the USDA Agricultural Research Service Forage and Range Research Laboratory in Logan, Utah.

Laynee Jones joined Mountain Accord in October 2013 as the Program Manager. Mountain Accord is an unprecedented collaboration of more than 20 public and private organizations coming together to make critical decisions for the long-term future of the central Wasatch Mountains. Laynee has 20 years of experience including transportation, environmental/NEPA, planning, and water quality. She graduated with a BS in civil engineering from Texas A&M in 1992 and began her career as an environmental engineer in Fort Worth, Texas. Laynee moved to Park City, Utah in 1997 to realize her lifelong dream of living in the mountains. She continued consulting in the environmental and transportation arenas, with short breaks to work at the Salt Lake Olympic Committee and the Sundance Film Festival. In 2008 Laynee joined Lochner and developed environment and transit practices until she joined the Mountain Accord program in 2013. Laynee enjoys skiing, mountain biking, and fishing in her free time.
Leslie G. Kelen was born in Budapest, Hungary and emigrated to the United States in 1959 with his parents, grandmother, and younger sister. He received a BA in Mathematics from Lehman College in the Bronx and an MA in Creative Writing from the City College of New York. Kelen started working on documentary-style projects in the late 1970s. In 1983, he co-founded the Oral History Institute, which became the Center for Documentary Arts in 2000 and the Center for Documentary Expression and Art in 2011. He is the co-author of five books and two chapbooks of poetry, including Missing Stories: An Oral History of Ethnic and Minority Groups in Utah (1996), Sacred Images: A Vision of Native American Rock Art (1996), Faces and Voices of Refugee Youth (2002), and This Light of Ours: Actvitist Photographers of the Civil Rights Movement (2011.) In July 2003, together with his wife, received the National Education Association's Applegate-Dorros Peace and International Understanding Award.

Roger Kjelgren is a Professor of Urban Landscape Horticulture in the Plants, Soils, and Climate Department at Utah State University. His research focuses on tree water use and water stress response in the landscape and in forest and fruit tree applications. His current research includes collaboration with the Forest Service, Brigham Young University, and Columbia University to use tree ring data to reconstruct historic drought and stream flow conditions in Utah to assist water management decisions. Most recently he has been a Jefferson Science Fellow for the Department of State in Washington, D.C.

Kelly Kopp is a professor and Extension Specialist in the Department of Plants, Soils and Climate at Utah State University where her research efforts are focused on landscape water conservation and turfgrass science. She is the director of USU's Center for Water Efficient Landscaping and serves on the board of directors of the Utah Water Conservation Forum. She is also the chair of the Alliance for Water Efficiency, a stakeholder-based, non-profit organization dedicated to the efficient and sustainable use of water in the U.S. and beyond. She works directly with many of the federal, state, and municipal agencies in the western U.S. that are working toward achieving meaningful landscape water conservation in the region and nation.

Rachel LeBlanc has been retired from a long career that included the medical device, aerospace and automotive industries. Her interests since retirement include volunteering for Citizen Science projects. She has participated in bird surveys on the Nature Conservancy's Great Salt Lake Nature Preserve in Davis County and Tracy Aviary's ongoing birding activities in the City Creek and Jordan River watersheds in the Salt Lake Valley. She is also currently volunteering in the Entomology Department at the Utah Museum of Natural History helping to digitize the collection. She holds a B.S. degree in Chemistry from the University of New Hampshire.

Ron Lund has been working in the Salt Lake County Health Department Division of Environmental Health for the past fourteen years. He is the Division's Enforcement and Training Coordinator and works on the after-hours emergency response team. In this position he works with the County's Criminal Investigator, D.A.'s office and other agencies to assist with Environmental Health investigations. He has a Masters of Public Health Degree from the University of Utah and is a HAZMAT Tech. He enjoys time spent on the emergency response team, including; working with other agencies to solve problems, conducting investigations, taking enforcement actions related to Clean Water Act violations, and educating industry and the public about environmental health. A highlight of his career is the Health Department's food inspections web page. Ron is an avid cyclist and soccer player. He enjoys dancing with his two daughters, playing soccer, potty training his boys, and playing monster. His twin boys are four and keep him laughing. He enjoys dutch oven cooking, puzzles, playing games, and watching movies with his wife.

Alan Matheson is the Senior Environmental Advisor to Utah Governor Gary R. Herbert and the State Planning Coordinator for the State of Utah. Alan previously served as Executive Director of Envision Utah, as a partner in a Phoenix law firm, as senior attorney and environmental policy advisor for Arizona's largest electric utility, and as the founding director of the Utah Water Project for Trout Unlimited.In the community, Alan has served on several boards and committees, including the Western Governors' Association Staff Advisory Council (Chair), Envision Utah Board of Trustees (Vice Chair), the Utah Clean Air Partnership (UCAIR) board (Secretary), Wasatch Front Regional Council, Mountain Accord Management and Executive Committees, and the Sandy City Planning Commission (Chair). Alan received his A.B. in International Relations from Stanford University and graduated from the UCLA School of Law where he was an editor of the UCLA Law Review. He was a finalist for the 2010 Ernst & Young Entrepreneur of the Year Award.

Clint McAffee started his career in the water industry in the 90's as a snowmaking crew leader at Park City Mountain Resort and kept working in that capacity through college and part time into his engineering career. Clint received a Bachelors in Civil Engineering from the University of Utah where he specialized in water resources engineering. Clint spent almost a decade working as an engineering consultant working on water system design, master planning, and construction management on projects around the western United States. Clint has been with Park City Municipal Corporation since 2010 first as their Water Engineering Manager before being promoted through the ranks to Water and Streets Director. Clint's current responsibilities include overall management of the Park City drinking and raw water system and enterprise fund which generally includes eight sources, two water treatment

plants, two abandoned drain tunnels, and two import connections. Clint is also responsible for the maintenance and management of pavements, hardscapes, street lights, and winter snowplowing and hauling for Park City.

Daniel McCool is the director of the Environmental and Sustainability Studies Program and a professor in the Political Science Department at the University of Utah. He has won a number of awards for his teaching and publications. His research focuses on water resources development, public lands policy, voting rights, and American Indian water rights. He has written and been interviewed widely on environmental issues, particularly related to water in the west. He is the author of eight books, and has published widely in such journals as the Cornell Journal of Law and Public Policy, Political Research Quarterly, and the University of Texas Law Review. He holds a Ph.D. in Political Science from the University of Arizona. He has served as a consultant for the National Oceanic and Atmospheric Administration, the U. S. Department of Justice, The ACLU's Voting Rights Project, and the Southwest Center for Environmental Research and Policy.

Olivia Miller is a Ph.D. graduate student in the Department of Geology & Geophysics at the University of Utah. She received her undergraduate degree in Earth & Environmental Science from Wesleyan University and her Masters degree in Geology from the University of Utah. Her research focuses on geochemistry of dust deposition in the Wasatch Mountains and hydrology related to melting of the Greenland ice sheet.

Michael Mills has been working for the June Sucker Recovery Implementation Program (JSRIP) for the past seven years, where he coordinates research and recovery actions to improve the status of the endangered June sucker, an endemic species found in Utah Lake and its tributaries. He has been involved in the ongoing removal of common carp from Utah Lake and restoration of habitat along Hobble Creek, as well as other projects initiated by the JSRIP. Prior to employment with the JSRIP, Michael worked as an aquatic biologist for the Utah Division of Wildlife Resources. He studied as an undergraduate at Utah State University where he obtained a degree in Fish and Wildlife Management. He also holds a master's degree from Brigham Young University in Zoology.

Ann Ober is a Senior Policy Advisor for Park City Municipal Government. Over the past 12 years, Ann has worked throughout the region on Environmental policy. Previously with Salt Lake County and Salt Lake City, Ann's focus has been the long term sustainability of our communities. Ann is a graduate of Pacific Lutheran University and has a Master of Public Administration degree from the University of Utah.

Christine A. Pomeroy is an Associate Professor in the Urban Water Engineering & Sustainability Group in the Department of Civil and Environmental Engineering at the University of Utah, where she teaches courses in hydraulics, stormwater management and urban water infrastructure. She has 18 years of academic and consulting experience in urban water infrastructure, green infrastructure, stormwater best management practices, watershed management and permitting and compliance. Dr. Pomeroy earned a B.S. in Civil Engineering from Michigan State University and an M.S. and Ph.D. in Civil Engineering from Colorado State University. She is a registered professional engineer in Michigan.

Robert H. Ramsey, P.G. M.S. Geology, University of Southern California, B.S. Geology, University of Southern California. Bob has more than 40 years of environmental, geologic and engineering consulting experience. He has exceptional analytical, organizational, management and leadership skills. He has proven experience in project/ program management and is noted for providing outstanding client service. His areas of technical expertise include sustainable water resource planning, development and management; water rights; groundwater development; water quality assessments and regulatory compliance. Bob regularly consults with municipalities, water conservancy and special improvement districts, as well as the private sector clients.

Larry Rupp is Extension Specialist and Professor of Landscape Horticulture in the Plants, Soils, and Climate Department and the Center for Water Efficient Landscaping at Utah State University. His research focuses on selection and propagation of native plants for use in water conserving landscapes as primarily funded by the USDA Specialty Crops Block Grant program through the Utah Department of Agriculture and Food. He is also director of the Masters of Professional Studies in Horticulture – Water Efficient Landscape Management specialization graduate degree program at Utah State University.

Jeff Salt, a native Oregonian, is one of Utah's leading advocates for clean water, watershed protection, and defense of public trust resources. Mr. Salt is the founder and Executive Director of Great Salt Lakekeeper. He currently serves as a board member of Salt Lake County Fish & Game Association, a member of Utah's Mercury Work Group, and as a member of the Utah Angler's Coalition. Previously, Mr. Salt has served as a board member of Waterkeeper Alliance; board member and President of the Jordan River Foundation; Executive Director and Education Director of Great Salt Lake Audubon; Co-Chair of the Utah Watershed Coordinating Council; Chairman of the Salt Lake City Mayor's Open Space Advisory Committee; Co-Founder and Steering Committee Chair of the Jordan River Natural Areas Forum; and as a member of former Utah Governor Walker's Watershed Initiative planning committee. Mr. Salt co-authored the Jordan River Natural Conservation Corridor Report (2000) and developed the Navigational Hazards Assessment and Recreational Boating Plan for the Jordan River (2000-2001).

Nick Schou grew up alongside the Wasatch Mountains and has spent time throughout the state, including years in the Uintah Basin. He received a M.S. in Environmental Humanities from the University of Utah, and spent five seasons with the US Fish and Wildlife Service doing field work for the Upper Colorado River Fishery Recovery Program. As a longtime supporter and volunteer of the URC, Nick is thrilled to be part of the staff, and proud to advocate for Utah's amazing rivers.

Pat Shea Dilworth Elementary School; Hillside Junior High School; Highland High School; Stanford University; Oxford University; Harvard University; Van Cott Bagley, Partner; Patrick A. Shea, PC; Counsel Senate Foreign Relatons Committee; Director of Bureau of Land Management, Department of Interior; Associate Research Professor of Biology, University of Utah

Bill Stack As Deputy Director of Programs, Bill's principal responsibility is the development of new and innovative projects to support the strategic plan as well as keeping the Center at the forefront of issues affecting the environment. This has involved the development of several proposals and work plans for projects as diverse as stormwater financing studies and ultra-urban watershed planning. Bill is also responsible for staying current of local, state and national programs and regulations and developing position papers on key issues such as the new rulemaking for the Municipal Separate Storm Sewer System and Sanitary Sewer Overflow regulations. Bill has a work history spanning over 35 years and is the senior mentor for technical staff.

Philip Stoker is PhD Candidate in the department of City and Metropolitan Planning. Philip has a Master's degree in Resource and Environmental Management, and a Bachelor of Science in Environmental Management. He has conducted environmental and social science research internationally, including work with the World Health Organization, Parks Canada, the National Park Service and the Vancouver 2010 Olympic Games. Currently, he is an iUTAH graduate research fellow investigating urban water use.

Scott Teeters obtained a Chemical Engineering degree from the University of Tennessee in 2011 and has since been drawn to the world of environmental engineering. He moved to Utah in 2013 to attend the University of Utah's Environmental Engineering Graduate program and hopes to return to environmental consulting after graduation. His interests include wetland water quality, industrial waste water treatment, and groundwater remediation.

David Waldron, P.E., S.E. M.S., Civil & Environmental Engineering, Utah State University, B.S., Civil & Environmental Engineering, Utah State University. Mr. Waldron's 20 years of experience includes extensive site development, storm water modeling, runoff mitigation, and infrastructure studies for county, districts, and state clients. He is intimately familiar with damages caused by fires and the resulting and continued damage from flooding from rainfall events over burned areas. His passion is to develop plans, means and methods to protect habitat, restore sites, and protect citizens.

Suzanne Walther, Ph.D., is an assistant professor and fluvial geomorphologist in the Department of Earth Science at Utah Valley University. Her primary interests are in fluvial geomorphology and river hydrology, with an emphasis on water resources management and human-environment interactions in river systems. She uses remote sensing and GIS (Geographic Information Systems) to study the riverscape, particularly for use in environmental management. Her current research includes projects on the Jordan River near Utah Lake, where we are investigating isotopic and

sedimentary changes from pre-settlement to modern day, and on Pleasant Creek in Capitol Reef National Park, where we are using high resolution imagery, GIS, and Geomorphic Change Detection to quantify the geomorphic impacts of seasonal flash flooding.

Weihong Wang is an Assistant Professor in the Department of Earth Science at Utah Valley University. She graduated with a Ph.D. degree in Marine Science from the University of South Carolina in 2008. Her research interests include Carbon Dynamics in Wetland Ecosystems, Climate Change and Sea Level Rise, and Energy Use and Sustainability. Her current research effort is focusing on using multi-proxies, such as stable isotope, trace metal, 210Pb and 14C dating, sediment particle distribution analysis, etc., to investigate anthropogenic impacts on Utah Lake and its surrounding wetlands. The ongoing project she has been working on with her collaborators is Investigating PCB and Trace Element Levels in Soil, Plant and Fish Species in Utah Lake.

Peter Woodruff is project assistant for the Conservation Science Department at Tracy Aviary where he helps manage the Citizen Science Project. Peter also works as the Outreach and Recruitment Coordinator for the American Conservation Experience (ACE), and manages a Wilderness Study Area monitoring pilot project with the Bureau of Land Management and ACE. When not orchestrating volunteer efforts across Utah, Peter enjoys romping in the snow, sun, and rain.

Notes